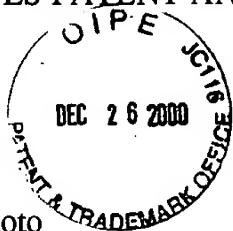


IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Art Unit : 1762
Examiner : M. Cleveland
Serial No. : 09/125,128
Filed : August 11, 1998
Inventors : Yuichiro Iguchi
: Masahiro Matsumoto
: Yuko Mikami
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: Takao Sano
: Yoshiyuki Kitamura
: Yoshinori Tani
: Hideki Ikeuchi
Title : A METHOD AND APPARATUS
: FOR PRODUCING A
: PLASMA DISPLAY



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Docket: 1084-98

#12
(NE)
unsigned

DECLARATION OF YUICHIRO IGUCHI

Assistant Commissioner for Patents
Washington, DC 20231

Sir:

I, Yuichiro Iguchi, declare that I reside at 24-8, Ichiriyama 1-chome, Otsu-shi, Shiga 520-21, Japan, that I am one of the inventors named in the above-identified U.S. Patent Application, that I have for many years been employed by Toray Industries, Inc. and that I am thoroughly familiar with the art relating to plasma display panels.

There are three principal methods of forming phosphor layers suitable for use in a plasma display panel. These methods are screen printing, photo paste and direct printing in accordance with this invention. Attached to this Declaration is a sheet entitled "Phosphor Layer Forming Methods" that displays all three forming methods and provides advantage and disadvantage information concerning all three methods.

Screen printing has an advantage of low paste loss or high paste utilization. However, it suffers several serious deficiencies in that it is not able to provide high resolution. This is largely because the screen method utilizes three screens and the screens are rapidly deformed over the course of repeated printing, which lowers accuracy and makes it difficult to form fluorescent material layers capable of providing a highly precise

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plasma display. There is also the disadvantage that the cost of utilizing such screens is quite high because they must be frequently replaced. As a practical matter, screen printing methods are limited to producing only about 200 plates before screens need to be replaced.

Photo paste forming is another method that is capable of producing relatively high resolution. However, it is quite inefficient in the use of paste, which is extremely expensive on a per gram basis. As a practical matter, such high cost is severely detrimental to the widespread use and affordability of plasma display panels.

The last method, direct printing in accordance with the invention, has the advantage of producing not only high resolution, but highly efficient use of paste which results in a curing of the problems associated with prior art methods. In fact, the direct printing method in accordance with the invention results in a significant difference in utilization of paste. For example, in direct printing in accordance with the invention, all paste that is supplied is likewise used. This is in sharp contrast to the photo paste method wherein approximately 30% of the paste is lost during phosphor layer forming. Once again, this is highly important in view of the high cost of such paste on a per gram basis.

Also attached hereto are three photographs of cross-sections taken through a phosphor layer and the associated substrate and ribs. It can be seen that the thickness of the coating layer is extremely uniform and well controlled, which is highly useful in controlling paste loss consumption, as well as maximizing resolution of the resulting plasma display panel.

The method of the invention is contrasted to the methods of the prior art such as Shinoda and US '836. Shinoda discloses and teaches the screen printing method described above and, as a consequence, contains its methodological and structural deficiencies, as well as the resulting disadvantage of poor resolution.

The invention is also different from US '836 by virtue of the utilization of a position controller operative and effective to adjust the angle of inclination of the paste applicator

to top ends of the barrier ribs of the substrate, while keeping tips of the outlet holes of the paste applicator at a predetermined distance from the barrier ribs of the substrate. We have found this to be a surprisingly advantageous feature of the invention which overcomes the difficulties encountered in providing a plurality of outlet holes in such confined spaces and under the operating conditions and close tolerances required to achieve the appropriate layer formation and the resulting plasma display panel. Appreciation for the controller permits our invention to produce plasma display panels having coating layers of the type that are efficient and highly uniform as shown in the three microphotographs attached hereto. US '836 is markedly less capable because it lacks such a controller.

Finally, I have personally conducted or supervised the conduct of all of the work reported in the Examples in the specification, I am thoroughly familiar with the results obtained. All of this work is correctly reported and the results obtained are actual results obtained in actual test work by me or by others under my supervision. I further confirm the importance of the parameters set forth in the claims, as clearly shown by the Examples as compared to the Comparative Examples contained in the specification as filed, which distinguishes this invention over US '836, Shinoda et al. and the other prior art.

The undersigned declares that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and thus such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: _____

Yuichiro Iguchi, Co-inventor